

REMARKS

Claims 25-30, 34-39 and 44-45 remain pending. Favorable reconsideration is respectfully requested.

Applicants would like to thank Examiner Piziali for the helpful and courteous discussion held with their representative on May 5, 2006. During the discussion, Applicants' representative pointed out that, based on the description of the description in the specification, one skilled in the art interpreting the claims in light of the specification would appreciate that the coating specified in Claims 25-30, 34-39 and 44-45 necessarily was mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. The following remarks expand on the discussion with the Examiner.

1. Claims 25-27, 29-30, and 34-36 Are Not Unpatentable Under 35 U.S.C. §102(e) or §103(a) Over Vandiest (U.S. patent No. 5,721,054).

Applicants submit herewith a second executed Rule 132 Declaration from Dr. Bernard Nghiê. Dr. Nghiê has read and is familiar with the specification and the subject matter of claims 25-30, 34-39 and 44-45 of the present application (see paragraphs 4-6 of the Declaration).

Dr. Nghiê has carefully reviewed the description of the coating in the specification (see paragraph 7 of the Declaration). Based on that review, Dr. Nghiê concludes that:

In view of the description provided by the specification of the above-identified application, one skilled in the art would have concluded that the coating of the invention described therein and specified in the claims identified above was mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. [See paragraph 8 of the Declaration; emphasis added]

Dr. Nghiêm acknowledges that the specification does not contain explicitly state that the coating is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing. However, he states:

...for the reasons discussed above, one skilled in the art reading that specification would appreciate that the coating of the substrates specified in claims 25-30, 34-39 and 44-45 of the above-identified application necessarily had those properties in order to be used as a glazing in the specification. [See paragraph 9 of the Declaration.]

Applicants submitted the first executed Rule 132 Declaration from Dr. Nghiêm on November 23, 2005. In that Declaration, Dr. Nghiêm discusses that procedure for depositing titanium oxide coatings. See the top of page 2 of the Declaration. Dr. Nghiêm states:

After closely examining the deposition procedure described by Vandiest, I believe that, while the conditions given by Vandiest can work well with a mixture of tin tetrachloride and water, this is not the case for titanium tetrachloride and water. On the basis of experiments I performed, I can confirm that for the deposition of titania, the use of the $TiCl_4$ and water ends up creating a nanoparticle powder and does not form a homogeneous coating on the substrate surface. [See page 2 of the Declaration.]

Dr. Nghiêm points out attempting to deposit titanium dioxide under the conditions described by Vandiest produces the well-known result of creating powder as had been used in fluid flows to study the hydrodynamics of the flow (see the bottom of page 2 and the top of page 3 of the Declaration).

Beginning at the bottom of page 3 of the Declaration, Dr. Nghiêm describes the deposition procedures as described in patents referred to by Vandiest in the specification of the patent. Dr. Nghiêm states

If such a configuration (in figure 3) is used with water and titanium tetrachloride, at the intersection region between the 2 flows from the 2 nozzles, nano powder is formed instead of a coating. [Declaration page 3, last sentence.]

So if this kind of tool is used with TiCl_4 and water instead of SiH_4 and O_2 , nano power is formed before arriving on the substrate surface. [Declaration page 4, last sentence.]

Beginning at page 6 of the Declaration, Dr. Nghiêm describes experiments that were conducted in order to reproduce the conditions of the deposition and the tool for the gas injection mentioned by Vandiest and FR2648453. Dr. Nghiêm summarizes the results of the experiments at the top of page 9, stating:

With the preceding deposition parameters, we could not deposit any real coating. Instead, we have produced powder, part of which weakly adheres to the surface of the substrate when the experiment was over. This powder can be easily wiped out by a tissue cloth.

Dr. Nghiêm concludes as follows:

The process parameters described by Vandiest for the deposition of large gap semi conductor like SnO_2 or TiO_2 , starting from Ti or Sn tetrachloride with water as oxidant are only valid for the deposition of SnO_2 . In the case of TiO_2 , our own experiments and several scientific sources have proven clearly that even at low temperature TiO_2 powder is formed when TiCl_4 and water is brought into contact, instead of an homogeneous coating on the surface. [Declaration at the middle of page 9.]

Thus, the Declaration of Dr. Nghiêm demonstrates that the method described in Example 1 of Vandiest does not produce a photocatalytic coating of titanium dioxide on a substrate.

In fact, in Dr. Nghiêm's second Declaration submitted herewith he states:

For those reasons, the process parameters described by Vandiest do not provide a coating of photocatalytic titanium oxide that is mechanically resistant and sufficiently adherent to the substrate in order to be used as a glazing as specified in claims 25-30, 34-39 and 44-45 of the above-identified application. [See paragraph 11 of the second declaration.]

Applicants previously submitted an executed Rule 132 Declaration of Dr. L  thicia Gu  neau (hereinafter referred to as "the Declaration") with the Request for Reconsideration

on December 8, 2003. Dr. Guéneau has eight years of experience in the field of physico chemistry/self-cleaning glass (see paragraphs (1) and (2) of the Declaration).

Dr. Guéneau points out that in Example 2, Vandiest describes a glass substrate coated with a 41 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 45 nm (see paragraph (6) of the Declaration). In Example 3, Vandiest describes a glass substrate coated with a 85 nm TiO₂ layer, which, in turn, is coated with a layer of Fe, Co, and Cr oxides having a thickness of 46.5 nm (see paragraph (7) of the Declaration). According to Dr. Guéneau, Fe, Co, and Cr oxides are well-known to be poisons for photocatalysts. Therefore, one of ordinary skill in the art would limit the contents of those metal oxides because of their known properties as photocatalyst poisons (see paragraph (8) of the Declaration).

At page 10, lines 3-9 of the Reply Brief, the Examiner asserts that the analysis provided by Dr. Guéneau is contradicted by the specification of the present application and Kato. This is not the case. That this is so is demonstrated by Carneiro et al., Study of the Deposition Parameters and Fe-Dopant Effect in the Photocatalytic Activity of TiO₂ Films Prepared by dc Reactive Magnetron Sputtering, *Vacuum*, 78, 2005, pp. 37-46, a copy of which is submitted herewith. Carneiro et al. describe the effect of doping a photocatalytic coating of TiO₂ on a substrate with iron. At a low concentration of iron, the layer has higher photocatalytic activity as compared to the undoped layer. In contrast, a highly-doped layer has strongly decreased photocatalytic activity. In view of the foregoing, Dr. Guéneau's comments are not inconsistent with the specification of the present application and Kato.

In addition, in Examples 2 and 3, the TiO₂ layer is buried under the Fe-Co-Cr layer. For that reason, one would expect that accumulated organic matter could not be decomposed by the TiO₂ layer because it would never get to that layer. Therefore, such a layer is not photocatalytic as recited in the claims of the present application.

Referring to the Examiner's comments at the first full paragraph at page 13 of the Office Action dated February 21, 2006, the Declarations discussed above address both embodiments described in Vandiest. The two Declarations submitted by Dr. Nghiêm address the embodiment where the TiO_2 layer is on the surface, i.e., the non-absorbent layer is on the absorbent layer. The Declaration from Dr. Guéneau addresses the embodiment in which the TiO_2 layer is on the bottom, i.e., the absorbent layer is on the non-absorbent layer.

In view of the foregoing, Vandiest fails to describe or suggest the claimed coated substrate. Accordingly, withdrawal of these grounds of rejection is respectfully requested.

2. Claims 26-28 and 44-45 Are Not Unpatentable Under 35 U.S.C. §102(e) or §103(a) Over Kato (U.S. patent No. 6,284,314).

Dr. Guéneau notes that Kato is completely silent regarding the size of titanium oxide crystallites (see paragraph (15) of the Declaration). According to Dr. Guéneau, Kato also fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. See paragraph (18) of the Declaration.

According to Dr. Guéneau, the reference also fails to describe the contact angle or the root mean square (RMS) rugosity of the coating (see paragraph (16) of the Declaration). In Dr. Guéneau's opinion, Kato is completely silent with respect to the RMS rugosity of the coating and, therefore, fails to suggest a coating having a value between 2 and 20 nm. See paragraph (21) of the Declaration.

Dr. Guéneau also points out that Kato fails to explicitly disclose a layer which functions as a barrier to alkali metals originating from the substrate, and that the reference does not suggest that such a component would be desirable. See paragraph (19) of the Declaration. In addition, Dr. Guéneau points out that Kato describes the optional heating of solutions coated on substrates in the absence of a barrier layer to alkalis, such as sodium from

the substrate. Quartz glass substrates are described, which consist of SiO_2 , and do not contain alkalis. See paragraph (22) of the Declaration.

Claim 26 recites, *inter alia*, (1) a thin layer a thin layer forming a barrier to alkali metals originating from the substrate, which is located between the substrate and the coating, and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato does not identify a layer which functions as a barrier to alkali metals originating from the substrate, nor does the reference suggest that such a component would be desirable. Kato fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 26.

Claim 27 specifies, *inter alia*, (1) that the coating has contact angle with water below 5E after exposure to luminous rays and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato is completely silent with respect to the contact angle of the coating and, therefore, fails to suggest a coating having a value below 5E as claimed. In addition, Kato fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 27.

Claim 28 specifies, *inter alia*, (1) that the coating has an RMS rugosity between 2 and 20 nm and (2) that the crystallized titanium oxide is in the form of crystallites with an average size of between 60 and 100 nm. Kato is completely silent with respect to the RMS rugosity of the coating and, therefore, fails to suggest a coating having a value between 2 and 20 nm. In addition, Kato fails to suggest that the titanium crystallites have an average size of between 60 and 100 nm, since the reference fails to even mention titanium crystallites at all. Accordingly, Kato fails to suggest the coated substrate recited in Claim 28.

In view of the foregoing, Kato fails to describe the coated substrate specified in Claims 26-28. Withdrawal of this ground of rejection is respectfully requested.

3. Claim 38 is Not Unpatentable under 35 U.S.C. §103(a) over Vandiest in View of Any One of Ito et al. (U.S. patent No. 4,664,934), Lynam et al. (U.S. patent No. 5,076,673) or Weppner et al. (U.S. Patent No. 5,202,788).

As discussed above (see section (1)), Vandiest fails to describe or suggest the claimed coated substrate. The cited secondary references, taken in combination with Vandiest, fail to suggest the claimed coated substrate. Accordingly, withdrawal of this ground of rejection is respectfully requested.

4. Claim 39 Is Not Unpatentable Under 35 U.S.C. 103(a) Over Vandiest.

Claim 39 recites a windshield wherein at least the face of said windshield turned toward the inside of the passenger compartment is provided with a coating having photocatalytic properties and comprising titanium oxide at least partly crystallized in the anatase form.

As discussed above (see section (1)), Vandiest fails to described the photocatalytic coating of the present invention. In addition, as noted by Dr. Guéneau above, the purpose of the coating described in Vandiest is to have low solar factor and a high purity of reflected color (see column 2, lines 13-17 of the reference). Vandiest fails to describe that the coating described therein is photocatalytic or hydrophilic. In addition, as recognized by the Examiner, the glazing described by Vandiest is to be used for architectural buildings and not as a windshield. See paragraph (23) of the Declaration. In view of these differences, the reference fails to suggest the claimed windshield. Accordingly, withdrawal of this ground of rejection is respectfully requested.

5. Claims 25-30, 34-37, 39 and 44-45 are Not Unpatentable Under 35 U.S.C. §103(a) over Plumat et al. (U.S. patent No. 3,984,591) in View of Any One of Vandiest or Kato.

Plumat et al. describe a process for forming a metallic oxide coating on a substrate. See the Abstract. As recognized by the Examiner, Plumat et al. fail to disclose a coating of titanium oxide in the anatase form that is photocatalytic. See page 9 of the Office Action dated February 21, 2006.

As discussed above, neither Vandiest or Kato suggest the claimed coated substrate. Accordingly, the combination of Plumat et al. with either Vandiest or Kato fails to suggest the claimed invention. Withdrawal of this ground of rejection is respectfully requested.

6. Claim 38 is Not Unpatentable Under 35 U.S.C. §103(a) Over Plumat in View of Any One of Vandiest or Kato and in View of Any One of Ito, Lynam or Weppner.

As discussed above, the combination of Plumat et al. with either Vandiest or Kato fails to suggest the claimed invention. The cited secondary references fail to remedy that deficiency. Accordingly, those reference fail to suggest the electrically controlled variable absorption glazing recited in Claim 38. Withdrawal of this ground of rejection is respectfully requested.

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Reply to Office Action of February 21, 2006

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

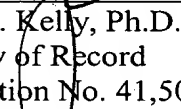
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